14. PRELIMINARY OPINION OF PROBABLE COSTS

14.1 PRELIMINARY COST DEVELOPMENT METHODOLOGY

This section presents the preliminary opinion of probable costs for the Fall Creek/White River Tunnel project and the Flow Augmentation System. All costs presented herein reflect price levels for January 2005 Engineering News Record Construction Cost Index (ENR-CCI = 7297), and include an allowance of 25 percent for contingencies. An additional allowance of 25 percent has been included for administration/program management, legal, engineering, construction administration, inspection services, surveying, real estate, and geotechnical investigations. The costs do not include contaminated soil and water mitigation, or unusual construction conditions other than those specifically identified herein.

The preliminary opinion of probable costs were developed using bid information and project experience with similar projects, budgetary costs provided by equipment manufacturers, published cost information, and the guidelines established in the Indianapolis Clean Stream Team (CST) "Cost Estimating Procedures for Raw Sewage Overflow Control Program" (CST, 2004). Bid information or opinions of probable costs for recent large diameter tunnel projects in Milwaukee, Cincinnati and Chicago were used to develop the costs for the Fall Creek/White River Tunnel. These projects had tunnels with finished diameters ranging from 20 to 33 feet and were located in carbonate rock, similar to that anticipated for the Fall Creek/White River Tunnel. Shaft costs were developed using project cost information in Cincinnati, Indianapolis, Milwaukee and Charleston, South Carolina. Cost for soft ground connection tunnels were based on recent bids and project experience in Chicago, Columbus, Indianapolis, Los Angeles, Sacramento and Seattle.

The Total Probable Construction Cost covers all costs as currently envisioned for project construction at this conceptual phase. These costs include land acquisition costs required for right-of-way or easements and 25 percent construction contingency. The Total Probable Project Cost includes Engineering, Legal and Administration fees estimated at 25 percent of the Total Probable Construction Cost. This includes engineering fees for facilities planning, design, inspection, construction

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management costs, project management, contract management and associated legal support costs.

To calculate present worth, the annual interest rate used is 5.875 percent per information from CST. The Present Worth O&M Cost is equivalent to the present worth of annual O&M costs over a 20-year period. The O&M costs, in general, include energy consumption (5 cents per kilowatt hour), labor requirements and equipment maintenance costs. The Total Estimated Present Worth Cost with O&M and Residual Costs represents the overall present worth analysis including all front end capital costs, annual O&M costs, service life (replacement) costs, and salvage value (if applicable).

Opinions of probable costs are included in Appendix H - Preliminary Opinion of Probable Costs. These itemized opinions incorporate the estimated present worth for the probable project capital, operation and maintenance, replacement and residual costs.

14.2 FALL CREEK/WHITE RIVER TUNNEL PROJECT

Preliminary opinions of probable costs were developed for the West, Central and East Tunnel alternatives. Costs for the main tunnel were developed for 95 and 97 percent capture of combined sewer overflows (CSOs). The costs for the consolidation sewers, drop shafts and connection tunnels associated with the Fall Creek and White River CSOs are based on sizing to 99 percent capture of CSOs. CSO outfall flows for 99 percent capture were not available for CSOs along White River; therefore estimated values were developed based on the size of the outfall. The size and associated costs for the consolidation sewers, drop shafts, and connection tunnels should be reviewed and modified as additional hydraulic data is developed.

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Basic assumptions regarding construction materials, construction techniques, equipment, and design parameters utilized in the cost development are discussed below:

Main Tunnel

- Cost for the main tunnel is based on one contract
- Tunnel excavation in competent carbonate rock at an average advance rate of 50 feet per day
- Main beam tunnel boring machine (TBM) used for tunnel excavation
- Limited pre-excavation, contact and cut-off grouting will be used to limit groundwater infiltration
- Tunnel supported with rock bolts and wire mesh with minimal additional support
- Tunnel primarily lined with unreinforced concrete at an average rate of 100 feet per day
- Reinforced concrete at shaft intersections and along minimal length of the tunnel in areas of incompetent rock
- Contact grouting required at the tunnel crown
- Cutoff grouting required to minimize groundwater infiltration
- Tunnel invert at 210 and 260 feet below grade surface (bgs) at the north and south ends of the tunnel, respectively

Connection Tunnels

- Drill-and-blast mining in rock
- Limited pre-excavation, contact and cut-off grouting will be used to limit groundwater infiltration in rock tunnels
- Tunneling in soil with a mechanical earth pressure balance machine (EPBM)
- Connection tunnels sized for 99 percent capture of CSOs

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Shafts

- Shallow shaft braced and shored, dewatering, and construction of a cast-in-place concrete liner or excavation (no dewatering) and sinking a caisson
- Shafts sized for 99 percent capture of CSOs
- For deep shaft construction through soil, smaller diameter shafts will be drilled and larger diameter shafts will require slurry wall construction
- For deep shaft construction through rock, drilling and blasting will be used for excavation and rock bolts and wire mesh for support
- Working shaft will be converted to a screening shaft at the conclusion of the tunnel construction
- Overburden assumed to be 100 feet and 110 feet north and south of 16th Street, respectively
- Shafts in rock assumed to be 225 feet deep north of 16th street and 250 feet deep south of 16th Street
- Vortex drops used to drop CSOs into the main tunnel
- Odor control and screening facilities at each drop shaft
- Screening shaft lined with reinforced concrete

Consolidation Sewers

- Consolidation sewers sized for 99 percent capture of CSOs
- Modifications of regulators to achieve 99 percent CSO capture
- Reinforced concrete pipe (RCP) Class IV with gaskets and polyvinyl chloride (PVC) liner used for corrosion protection
- Consolidation sewers average depth of 16 feet and without any rock excavation.
- Static screens included to limit solids entering the tunnel
- Minimum 48-inch cover

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Deep Tunnel Pump Station

- Deep shaft construction approximately 50 feet in diameter and approximately 300 feet deep
- 114 million gallons per day (mgd) (95 or 97 percent capture) firm initial capacity pump station expandable to 170 mgd (99 percent capture)
- Four pumping units each 57 mgd
- Single-story brick and block building superstructure approximately 100 feet by 200 feet in plan dimensions and 50 feet high.
- Piping and valves
- Approximately 7.5 feet diameter encased pipe between the screen shaft and Deep Tunnel Pump Station shaft to convey the stored CSO to the pumps
- Heating, Ventilation, Air Conditioning (HVAC) and plumbing
- Electrical and instrumentation
- Elevator shaft to the pumping equipment operating floor level
- Stairwell to the pumping equipment operating floor level

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14.2.1 West Alignment Alternative

The West Alignment alternative for the main tunnel is discussed in detail in Section 3 – Fall Creek/White River Tunnel and is shown on Figure 3.2. Table 14.1 lists the West Alignment alternative sizes and quantities.

Table 14.1
West Alignment Alternative

Main Tunnel Diameter at 95 Percent Capture[1]	26 feet
Main Tunnel Diameter at 97 Percent Capture[1]	33 feet
Main tunnel length	50,290 feet
Soft ground connection tunnels length (cumulative length)	5,670 feet
Rock connection tunnels (cumulative length)	14,500 feet
Number of Shallow shafts	4
Number of Deep shafts	21

[1] Based on Bluff Road working shaft site and Sutherland Avenue retrieval shaft site.

The opinion of probable costs for the complete West Alignment alternative for the main tunnel at 95 and 97 percent capture of CSOs is presented in Table 14.2.

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Table 14.2
Opinion of Probable Costs[1] – West Alignment Alternative

Item	Cost 95 Percent Capture	Cost 97 Percent Capture
Main Tunnel[2]	$185,600,000	$284,700,000
Connection Tunnels[3]	$82,800,000	$82,800,000
Consolidation Sewers[3]	$31,700,000	$31,700,000
Drop Shafts[3]	$60,900,000	$60,900,000
Deep Tunnel Pump Station	$62,300,000	$62,300,000
Land Acquisition, Easements and Maintenance of Traffic	$8,300,000	$10,800,000
Subtotal	**$431,600,000**	**$533,200,000**
Contingencies (25%)	$107,900,000	$133,300,000
Total Probable Construction Cost	**$539,500,000**	**$666,500,000**
Engineering, Legal, and Administration (25%)	$134,900,000	$166,700,000
Total Probable Project Cost	**$674,400,000**	**$833,200,000**

[1] All costs presented reflect price levels of January 2005 (ENR-CCI = 7297).
[2] Based on Bluff Road working shaft site and Sutherland Avenue retrieval shaft site.
[3] Connection tunnels, consolidation sewers and drop shafts sized for 99 percent capture.

14.2.2 Central Alignment Alternative

The Central Alignment alternative for the main tunnel is discussed in detail in Section 3 – Fall Creek/White River Tunnel and is shown in Figure 3.3. Table 14.3 lists the Central Alignment alternative sizes and quantities.

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Table 14.3 **Central Alignment Alternative**	
Main Tunnel Diameter at 95 Percent Capture[1]	27 feet
Main Tunnel Diameter at 97 Percent Capture[1]	34 feet
Main tunnel length	47,240 feet
Soft ground connection tunnels length (cumulative length)	15,890 feet
Rock connection tunnels (cumulative length)	9,390 feet
Number of Shallow shafts	10
Number of Deep shafts	16
[1] Based on Bluff Road working shaft site and Sutherland Avenue retrieval shaft site.	

The opinion of probable costs for the complete Central Alignment alternative for the main tunnel at 95 and 97 percent capture of CSOs is presented in Table 14.4.

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Table 14.4
Opinion of Probable Costs[1] – Central Alignment Alternative

Item	Cost 95 Percent Capture	Cost 97 Percent Capture
Main Tunnel[2]	$183,900,000	$282,600,000
Connection Tunnels[3]	$110,300,000	$110,300,000
Consolidation Sewers[3]	$31,700,000	$31,700,000
Drop Shafts[3]	$56,600,000	$56,600,000
Deep Tunnel Pump Station	$62,300,000	$62,300,000
Land Acquisition, Easements and Maintenance of Traffic	$8,900,000	$11,300,000
Subtotal	**$453,700,000**	**$554,800,000**
Contingencies (25%)	$113,500,000	$138,700,000
Total Probable Construction Cost	**$567,200,000**	**$693,500,000**
Engineering, Legal, and Administration (25%)	$141,800,000	$173,400,000
Total Probable Project Cost	**$709,000,000**	**$866,900,000**

[1] All costs presented reflect price levels of January 2005 (ENR-CCI = 7297).
[2] Based on Bluff Road working shaft site and Sutherland Avenue retrieval shaft site.
[3] Connection tunnels, consolidation sewers and drop shafts sized for 99 percent capture.

14.2.3 East Alignment Alternative

The East Alignment alternative for the main tunnel is discussed in detail in Section 3 – Fall Creek/White River Tunnel and is shown in Figure 3.4. Table 14.5 lists the East Alignment alternative sizes and quantities.

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Table 14.5 **East Alignment Alternative**	
Main Tunnel Diameter at 95 Percent Capture[1]	27 feet
Main Tunnel Diameter at 97 Percent Capture[1]	35 feet
Main tunnel length	44,200 feet
Soft ground connection tunnels length (cumulative length)	15,890 feet
Rock connection tunnels (cumulative length)	12,500 feet
Number of Shallow shafts	10
Number of Deep shafts	16
[1] Based on Bluff Road working shaft site and Sutherland Avenue retrieval shaft site.	

The opinion of probable costs for the complete East Alignment alternative for the main tunnel at 95 and 97 percent capture of CSOs is presented in Table 14.6.

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Table 14.6
Opinion of Probable Costs[1] – East Alignment Alternative

Item	Cost 95 Percent Capture	Cost 97 Percent Capture
Main Tunnel[2]	$182,300,000	$280,500,000
Connection Tunnels[3]	$126,100,000	$126,100,000
Consolidation Sewers[3]	$31,700,000	$31,700,000
Drop Shafts[3]	$56,600,000	$56,600,000
Deep Tunnel Pump Station	$62,300,000	$62,300,000
Land Acquisition, Easements and Maintenance of Traffic	$9,200,000	$11,700,000
Subtotal	**$468,200,000**	**$568,900,000**
Contingencies (25%)	$117,100,000	$142,300,000
Total Probable Construction Cost	**$585,300,000**	**$711,200,000**
Engineering, Legal, and Administration (25%)	$146,400,000	$177,800,000
Total Probable Project Cost	**$731,600,000**	**$889,000,000**

[1] All costs presented reflect price levels of January 2005 (ENR-CCI = 7297).
[2] Based on Bluff Road working shaft site and Sutherland Avenue retrieval shaft site.
[3] Connection tunnels, consolidation sewers and drop shafts sized for 99 percent capture.

14.2.4 Fall Creek/White River Tunnel Project Cost Summary

The Opinion of Probable Cost Summary for the Fall Creek/White River Tunnel project alternatives is summarized in Table 14.7.

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Table 14.7
Opinion of Probable Costs[1] Summary – Fall Creek/White River Tunnel Alternatives

Item	95 Percent Capture	97 Percent Capture
West Alignment Alternative		
Total Probable Construction Cost [2, 3, 4]	**$539,500,000**	**$666,500,000**
Engineering, Legal, and Administration (25%)	$134,900,000	$166,700,000
Total Probable Project Cost	**$674,400,000**	**$833,200,000**
Central Alignment Alternative		
Total Probable Construction Cost [2, 3, 4]	**$567,200,000**	**$693,500,000**
Engineering, Legal, and Administration (25%)	$141,800,000	$173,400,000
Total Probable Project Cost	**$709,000,000**	**$866,900,000**
East Alignment Alternative		
Total Probable Construction Cost [2, 3, 4]	**$585,300,000**	**$711,200,000**
Engineering, Legal, and Administration (25%)	$146,400,000	$177,800,000
Total Probable Project Cost	**$731,600,000**	**$889,000,000**

[1] All costs presented reflect price levels of January 2005 (ENR-CCI = 7297).
[2] Total Probable Construction Cost includes an allowance of 25% for contingencies.
[3] Connection tunnels, consolidation sewers and drop shafts sized for 99 percent capture.
[4] Based on Bluff Road working shaft site and Sutherland Avenue retrieval shaft site.

The Fall Creek/White River Tunnel project costs are presented graphically on Figures 14.1 and 14.2. The Total Probable Construction Cost covers all costs as currently envisioned for project construction at this conceptual phase. These costs include land acquisition costs required for right-of-way or easements and 25 percent construction contingency. The Total Probable Project Cost includes Engineering, Legal and Administration fees estimated at 25 percent of the Total Probable Construction Cost. This includes engineering fees for facilities planning, design, inspection, construction management costs, project management, contract management and associated legal support costs.

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To calculate present worth, the annual interest rate used is 5.875 percent per information from CST. The Present Worth O&M Cost is equivalent to the present worth of annual O&M costs over a 20-year period. The O&M costs, in general, include energy consumption (5 cents per kilowatt hour), labor requirements and equipment maintenance costs. The Total Estimated Present Worth Cost with O&M and Residual Costs represents the overall present worth analysis including all front end capital costs, annual O&M costs, service life (replacement) costs, and salvage value (if applicable). Detailed cost spreadsheets for the Fall Creek/White River Tunnel project are presented in Appendix H – Preliminary Opinion of Probable Costs.

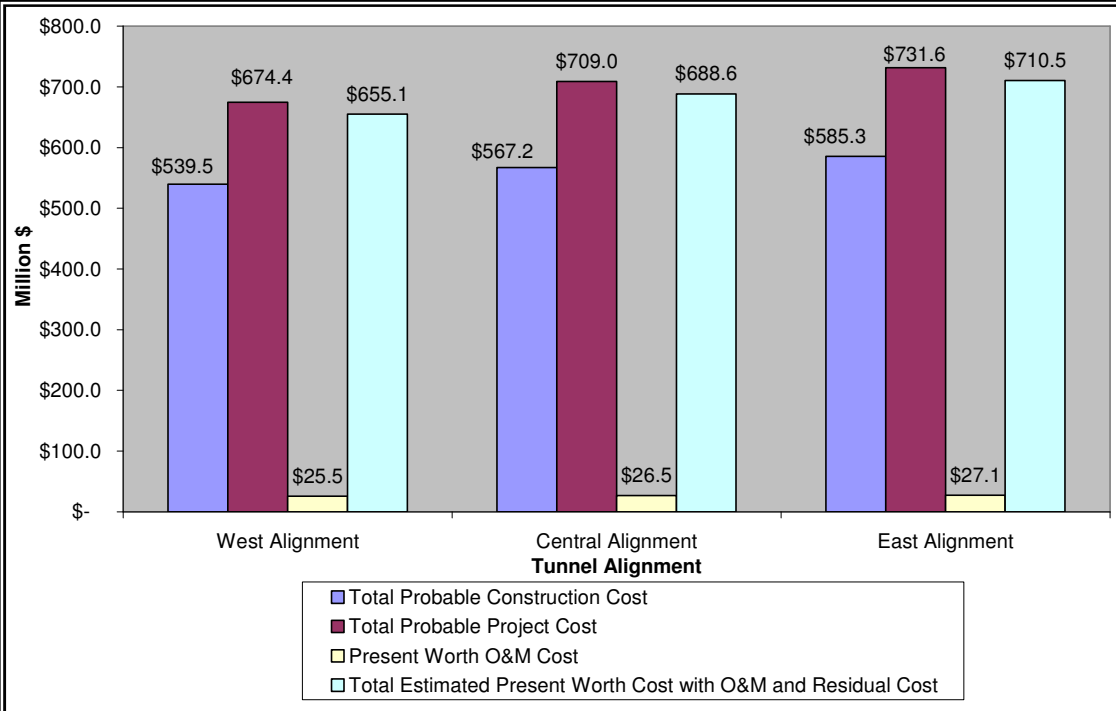

Figure 14.1 Tunnel Project Probable Costs for 95 Percent Capture

Note: All costs presented reflect price levels of January 2005 (ENRCCI = 7297).

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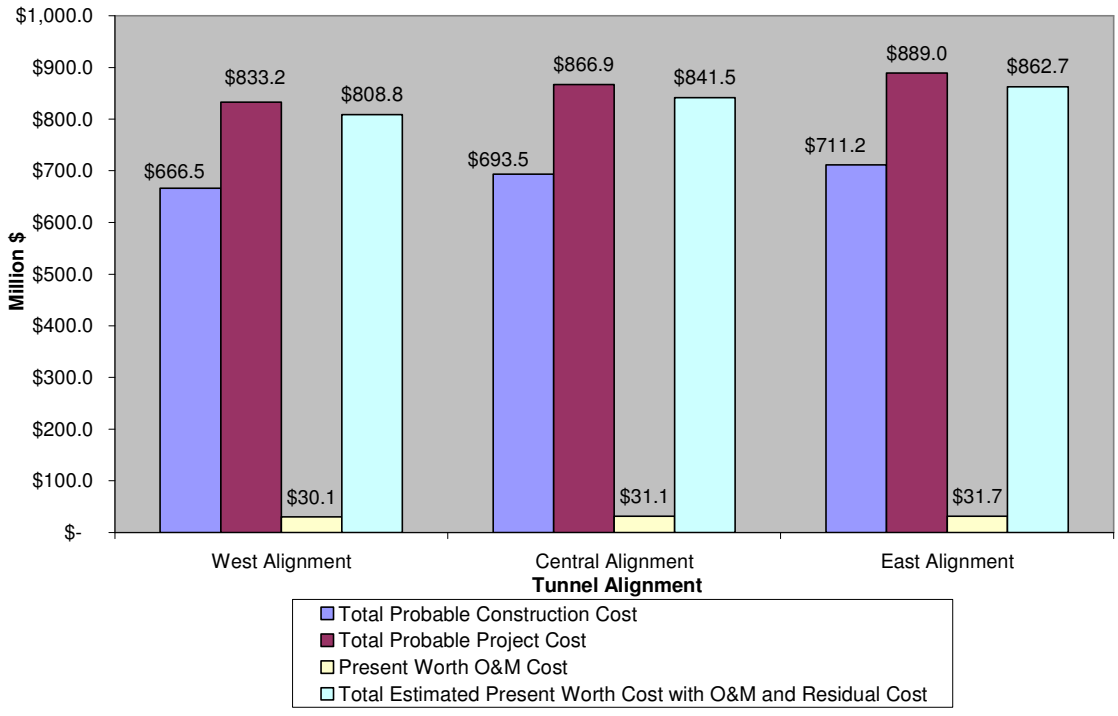

Figure 14.2 Tunnel Project Probable Costs for 97 Percent Capture

Note: All costs presented reflect price levels of January 2005 (ENRCCI = 7297).

14.2.5 Working and Retrieval Shafts

The costs presented above for the West, Central and East Alignment alternatives assumes the use of the Bluff Road working shaft and Sutherland Avenue retrieval shaft sites. The ultimate selected working and retrieval shafts sites will have an impact on the construction cost. The cost difference is primarily due to the length of the connection tunnels between the drop shafts and the connection tunnels associated with each working shaft, and the length of the Deep Tunnel Pump Station connection to the Interplant Connection Structure. A summary of the cost differences between the working and retrieval shafts are shown in Table 14.8.

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Table 14.8
Comparative Estimated Construction Cost[1] of Working and Retrieval Shaft Alternatives

Shaft Type	Shaft Alternatives	Construction Cost Variation[2]
Working Shaft	Bluff Road Site	$0 (baseline)
	Southern Avenue Site	$4M
	Reilly Site	$36M
Retrieval Shaft	Sutherland Avenue Shaft	$0 (baseline)
	Keystone Dam Shaft	-$28M

[1] All costs presented reflect price levels of January 2005 (ENR-CCI = 7297).

[2] The cost variation includes an allowance of 25% for contingencies.

14.3 FLOW AUGMENTATION SYSTEM

As part of the Flow Augmentation System, preliminary opinions of probable costs were developed for the following:

- Belmont AWT Effluent Pump Station
- Belmont Force Main
- Outfall Structures for Fall Creek, Pogues Run, and Pleasant Run

14.3.1 Belmont AWT Effluent Pump Station

The basic assumptions and design parameters utilized in the cost development of the Belmont AWT Effluent Pump Station are as follows:

- Single-story brick and block building approximately 40 feet by 80 feet in plan dimensions and 25 feet high
- 60 mgd total pump station capacity
- Six pumping units each 10 mgd
- Bridge crane for removal of pumps

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- Piping and valves
- Flow control and diversion structures to divert effluent to the pump wetwell
- HVAC and plumbing
- Electrical and instrumentation

The opinion of probable costs for the Belmont AWT Effluent Pump Station is presented in Table 14.9.

Table 14.9
Opinion of Probable Costs[1] – Belmont AWT Effluent Pump Station

Item	Cost
General Requirements	$900,000
Site Work	$250,000
Concrete & Masonry	$2,000,000
Pumps & Motors	$2,000,000
Electrical Equipment	$2,000,000
Piping	$500,000
Flow Diversion Structures	$800,000
Instrumentation & Controls	$500,000
HVAC	$300,000
Miscellaneous	$350,000
Subtotal	**$9,600,000**
Contingencies (25%)	$2,400,000
Total Probable Construction Cost	**$12,000,000**
Engineering, Legal, and Administration (25%)	$3,000,000
Total Probable Project Cost	**$15,000,000**

[1] All costs presented reflect price levels of January 2005 (ENR-CCI = 7297).

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14.3.2 Belmont Force Main

The basic assumptions and design parameters utilized in the cost development of the Belmont Force Main alternatives are as follows:

- Alternative 4B and 5B are approximately equal in cost, hence only the cost for Alternative 4B is included herein
- Piping and fittings costs are based on using ductile iron pipe (DIP) Class 350
- Air and vacuum release valves placed at 2,500-foot intervals and at high points in the pipeline
- Plug valves placed at one mile intervals

The opinion of probable costs for the Belmont Force Main is presented in Table 14.10.

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Table 14.10 **Opinion of Probable Costs[1] – Belmont Force Main**	
Item	**Cost**
General Requirements	$3,300,000
Right-of-Way and Land Acquisition	$300,000
Excess Materials Disposal	$100,000
Casings	$200,000
Ductile Iron Pipe	$15,000,000
Vertical Shafts for White River Crossing	$2,200,000
Soft Ground Tunnel for Casings	$1,000,000
Pavement Repair	$1,800,000
Ductile Iron Fittings	$1,200,000
Air & Vacuum Release Valves w/ enclosures	$100,000
Valves	$5,800,000
Subtotal	**$30,900,000**
Contingencies (25%)	$7,700,000
Total Probable Construction Cost	**$38,600,000**
Engineering, Legal, and Administration (25%)	$9,600,000
Total Probable Project Cost	**$48,200,000**
[1] All costs presented reflect price levels of January 2005 (ENR-CCI = 7297).	

14.3.3 Fall Creek Outfall Structure Alternatives

Four outfall structure alternatives were evaluated as part of this project for Fall Creek flow augmentation. The basic assumptions and parameters utilized in the cost development of the outfall structure alternatives are as follows:

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Stair-Step Cascade Aerator Structure

- Cast-in-place concrete structure
- 10 stair-steps of concentric circles
- Top step is eight feet in diameter, base of the structure at grade is 48 feet in diameter

The opinion of probable costs for the Stair-Step Cascade Aerator Structure is presented in Table 14.11.

Table 14.11
Opinion of Probable Costs[1] – Stair-Step Cascade Aerator Structure

Item	Cost
General Requirements	$34,000
Site Work	$30,000
Concrete	$200,000
Piping	$10,000
Miscellaneous	$30,000
Subtotal	**$304,000**
Contingencies (25%)	$76,000
Total Probable Construction Cost	**$380,000**
Engineering, Legal, and Administration (25%)	$95,000
Total Probable Project Cost	**$475,000**

[1] All costs presented reflect price levels of January 2005 (ENR-CCI = 7297).

Side-Stream Cascade Aerator Structure

- Cast-in-place concrete structure
- Rectangular-shaped stair-step aeration structure
- Ten 2-foot long steps with each step having a 1-foot elevation drop
- Width of the structure is 60 feet

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The opinion of probable costs for the Side-Stream Cascade Aerator Structure is presented in Table 14.12.

Table 14.12
Opinion of Probable Costs[1] – Side-Stream Cascade Aerator Structure

Item	Cost
General Requirements	$25,000
Site Work	$30,000
Concrete	$125,000
Piping	$10,000
Miscellaneous	$30,000
Subtotal	**$220,000**
Contingencies (25%)	$55,000
Total Probable Construction Cost	**$275,000**
Engineering, Legal, and Administration (25%)	$69,000
Total Probable Project Cost	**$344,000**

[1] All costs presented reflect price levels of January 2005 (ENR-CCI = 7297).

Side-Stream Cascade Aerator Structure with Small Constructed Wetland

- Cast-in-place concrete structure
- 150 foot long, 1-foot high weir across the creek channel
- Rectangular-shaped stair-step aeration structure, similar to above alternative
- Ten 2-foot long steps with each step having a 1-foot elevation drop
- Width of the structure is 60 feet
- Two to three acre wetland

The opinion of probable costs for the Side-Stream Cascade Aerator Structure with Small Constructed Wetland is presented in Table 14.13.

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Table 14.13 **Opinion of Probable Costs[1] – Side-Stream Cascade Aerator Structure with Small Constructed Wetland**	
Item	**Cost**
General Requirements	$34,000
Site Work	$50,000
Concrete	$125,000
Planting and Landscaping Wetland	$40,000
Weir	$10,000
Piping	$10,000
Miscellaneous	$30,000
Subtotal	**$299,000**
Contingencies (25%)	$75,000
Total Probable Construction Cost	**$374,000**
Engineering, Legal, and Administration (25%)	$94,000
Total Probable Project Cost	**$468,000**
[1] All costs presented reflect price levels of January 2005 (ENR-CCI = 7297).	

Large Rocks with Small Constructed Wetland

- Riprap
- 150-foot long, 1-foot high weir across the creek channel
- Rectangular-shaped stair-step aeration structure
- Ten 2-foot long steps with each step having a 1-foot elevation drop
- Width of the structure is 60 feet
- Two to three acre wetland

The opinion of probable costs for the Large Rocks with Small Constructed Wetland is presented in Table 14.14.

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Table 14.14 **Opinion of Probable Costs[1] – Large Rocks with Small Constructed Wetland Area**	
Item	**Cost**
General Requirements	$22,000
Site Work	$60,000
Concrete	$25,000
Planting and Landscaping Wetland	$40,000
Weir	$10,000
Piping	$10,000
Miscellaneous	$30,000
Subtotal	**$197,000**
Contingencies (25%)	$50,000
Total Probable Construction Cost	**$247,000**
Engineering, Legal, and Administration (25%)	$62,000
Total Probable Project Cost	**$309,000**
[1] All costs presented reflect price levels of January 2005 (ENR-CCI = 7297).	

14.3.4 Pogues Run and Pleasant Run Outfall Structure Alternatives

Three outfall structure alternatives were evaluated as part of this project for Pogues Run and Pleasant Run flow augmentation. The basic assumptions and parameters utilized in the cost development of the outfall structure alternatives are as follows:

Stair-Step Cascade Aerator Structure

- Cast-in-place concrete structure
- 10 stair-steps of concentric circles
- Top step is 3’ 8” feet in diameter, base of the structure at grade is 43’ 8” feet in diameter

The opinion of probable costs for the Stair-Step Cascade Aerator Structure is presented in Table 14.15.

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Table 14.15 **Opinion of Probable Costs[1] – Stair-Step Cascade Aerator Structure**	
Item	**Cost**
General Requirements	$25,000
Site Work	$20,000
Concrete	$135,000
Piping	$7,000
Miscellaneous	$20,000
Subtotal	**$207,000**
Contingencies (25%)	$52,000
Total Probable Construction Cost	**$259,000**
Engineering, Legal, and Administration (25%)	$65,000
Total Probable Project Cost	**$324,000**
[1] All costs presented reflect price levels of January 2005 (ENR-CCI = 7297).	

Side-Stream Cascade Aerator Structure

- Cast-in-place concrete structure
- Rectangular-shaped stair-step aeration structure
- Ten 2-foot long steps with each step having a 1-foot elevation drop
- Width of the structure is 15 feet

The opinion of probable costs for the Side-Stream Cascade Aerator Structure is presented in Table 14.16.

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Table 14.16 **Opinion of Probable Costs[1] – Side-Stream Cascade Aerator Structure**	
Item	**Cost**
General Requirements	$15,000
Site Work	$10,000
Concrete	$30,000
Piping	$7,000
Miscellaneous	$10,000
Subtotal	**$72,000**
Contingencies (25%)	$18,000
Total Probable Construction Cost	**$90,000**
Engineering, Legal, and Administration (25%)	$23,000
Total Probable Project Cost	**$113,000**
[1] All costs presented reflect price levels of January 2005 (ENR-CCI = 7297).	

Side-Stream Cascade Aerator Structure Alternative

- Riprap w/cast in place concrete
- Rectangular-shaped stair-step aeration structure
- Ten 2-foot long steps with each step having a 1-foot elevation drop
- Width of the structure is 15 feet

The opinion of probable costs for the Large Rocks with Small Constructed Wetland is presented in Table 14.17.

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Table 14.17 **Opinion of Probable Costs[1] – Side-Stream Cascade Aerator Structure Alternative**	
Item	**Cost**
General Requirements	$15,000
Site Work	$10,000
Concrete	$20,000
Piping	$7,000
Miscellaneous	$10,000
Subtotal	**$62,000**
Contingencies (25%)	$16,000
Total Probable Construction Cost	**$78,000**
Engineering, Legal, and Administration (25%)	$20,000
Total Probable Project Cost	**$98,000**
[1] All costs presented reflect price levels of January 2005 (ENR-CCI = 7297).	

14.3.5 Flow Augmentation System Summary

The Opinion of Probable Cost Summary for the Flow Augmentation System alternatives is summarized in Table 14.18.

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Table 14.18
Opinion of Probable Costs[1] Summary – Flow Augmentation System

Item	Cost
Belmont AWT Effluent Pump Station	
Total Probable Construction Cost	$12,000,000
Engineering, Legal, and Administration (25%)	$3,000,000
Total Probable Project Cost[5, 6]	**$15,000,000**
Belmont Force Main[2]	
Total Probable Construction Cost	$38,600,000
Engineering, Legal, and Administration (25%)	$9,600,000
Total Probable Project Cost[5, 6]	**$48,200,000**
Fall Creek Outfall Structure[3]	
Total Probable Construction Cost[6]	$300,000
Engineering, Legal, and Administration[5] (25%)	$100,000
Total Probable Project Cost[5, 6]	**$400,000**
Pogues Run and Pleasant Run Outfall Structures[4]	
Total Probable Construction Cost[6]	$160,000
Engineering, Legal, and Administration[5] (25%)	$40,000
Total Probable Project Cost[5]	**$200,000**
Total Probable Project Cost for Flow Augmentation[5, 6]	**$63,800,000**

[1] All costs presented reflect price levels of January 2005 (ENR-CCI = 7297)
[2] Alternative 4B was selected per CDP analysis for the force main
[3] Large Rocks with Small Constructed Wetland option was selected per CDP analysis for the outfall
[4] Large Rocks structure was selected per CDP analysis for the outfall, and price reflects two structures, one each for Pogues Run and Pleasant Run
[5] Includes contingencies (25%)
[6] Rounded up to the nearest hundred-thousandth

14. PRELIMINARY OPINION OF PROBABLE COSTS

The Flow Augmentation System alternative costs are presented in Table 14.19. The basis and description of the items in the table is described under Section 14.3. Detailed cost spreadsheets for the Flow Augmentation System are presented in Appendix H - Preliminary Opinion of Probable Costs.

Table 14.19
Opinion of Probable Costs[1] Summary – Flow Augmentation System

Item	Cost
Belmont AWT Effluent Pump Station	
Total Probable Construction Cost	$12,000,000
Total Probable Project Cost	$15,000,000
Present Worth O&M Cost	$1,500,000
Total Estimated Present Worth Cost w/ O&M and Residual Costs	$16,200,000
Belmont Force Main[2]	
Total Probable Construction Cost	$38,600,000
Total Probable Project Cost	$48,200,000
Present Worth O&M Cost	$100,000
Total Estimated Present Worth Cost w/ O&M and Residual Costs	$39,100,000
Outfall Structures[3]	
Total Probable Construction Cost	$500,000
Total Probable Project Cost	$600,000
Present Worth O&M Cost	$100,000
Total Estimated Present Worth Cost w/ O&M and Residual Costs	$500,000

[1] All costs presented reflect price levels of January 2005 (ENR-CCI = 7297)

[2] Alternative 4B was selected per CDP analysis for the force main

[3] Large Rocks and Large Rocks with Small Constructed Wetland option was selected per CDP analysis for the outfalls